

NOTES ON SOME SPECIES IN THE FAMILY RUBIACEAE IN THE CAPE PENINSULA.

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ANTHOSPERMUM, GALIUM, NENAX and CARPACOCE (including a new species).

Little attention seems to have been paid to the small shrubby Rubiaceae of this district since Sonder's revision appeared in the *Flora Capensis*, Vol. III, in 1865. Very naturally, considering the very limited quantity of herbarium material at his disposal in Europe and the fact that he knew nothing about the plants in the field, there are inaccuracies in his work. I am here putting on record the result of a rather more intensive examination of some of the species which occur in the Cape Peninsula.

Most of these plants are rather inconspicuous, the flowers being almost invisible except on close examination, and, on account of their general resemblance to the prevailing ericoid-leaved vegetation, they are often passed over by collectors who have not an "eye" for them. Again, the examination of herbarium specimens reveals the fact that more often than not in the dioecious species only one sex has been collected, whereas to obtain a good knowledge of these plants it is often necessary to collect a quantity of specimens in different stages of development.

The complex genus *Anthospermum*, which is wide spread in South Africa, contains many yet unnamed species and would well repay a close study, but a great deal more well-collected material and field observation is required before an attempt at its revision can be advised.

In the genera *Anthospermum*, *Carpacoe* and *Nenax* the female plants have very much smaller corollas than the males and do not show any male elements, but the so-called male plants are often protandrous-hermaphrodite or at least show some female elements, while plants are sometimes found with pollenless anthers, functioning as females.

In some cases no dependence can be put upon the characters given in Sonder's keys.

Anthospermum aethiopicum, L. A very common plant in which colonies with ternate *outer whorls* of leaves are just as common as those having all the leaves opposite. In no other respect is there any constant difference and, in view of the great variability in this species, it seems that *var. oppositifolium*, Cruse, is scarcely worth distinction as a variety.

A rather smaller more bushy variety with smaller leaves occurs on the Lion's Mountain, which seems to agree fairly well with the description of var. *montanum*, E. and Z., of which I have not seen the type.*

The species appears to be purely dioecious with no indeterminate males and the flowers are always tetrandrous.

Anthospermum prostratum, Sond. The male corollas are usually 4-lobed but occasionally some with 5 lobes occur, in which case the flowers are pentandrous. No 5-lobed female corollas have been found. Occasional seed-producing hermaphrodite flowers occur on the male plants, but they are somewhat rare.

The varieties *velutinum*, Sond. and *glabrum*, Sond. are not worthy of retention. The stem and branches in all the living plants examined are downy, but occasional plants growing in association have distinctly downy fruits, though otherwise indistinguishable.

Anthospermum ciliare, L. The male or hermaphrodite plants show the greatest variation in degree of sex. Entirely male flowers and fertile hermaphrodites may be found on the same plant.

Var. **papillatum**, Sond., which is common in the southern half of the Peninsula, is very distinct, for besides having papillate fruits, the leaves are entirely without cilia. It is possibly worthy of specific rank, but owing to the number of variants under this species, growing all over the South-Western District, more investigation of the "group" is required before giving it a name.

Anthospermum Bergianum, Cruse. The lower leaves are often opposite, the outer whorls of the upper being 3-nate or rarely 4-nate. The majority of the plants are purely male and female, but fertile hermaphrodites occur, some with pollenless anthers.

Anthospermum hirtum, Cruse. The corolla in the female sometimes has only 4 lobes. Seeds are rarely produced in the hermaphrodite flowers except in occasional plants where all the anthers are pollenless.

Galium tomentosum, Thunb., the only indigenous species known in the Cape Peninsula, is dioecious, the female only producing the long white-villous peduncles which gave the species its name. Though the flowers appear at first sight to be perfect the anthers are without pollen.

The male plants, hitherto considered a different species and known as *G. asperum*, Thunb., differ only in having short pubescent peduncles and, though the flowers have rudimentary female organs, they develop no seed. After examining a large number of plants in the field, I found one only which was intermediate in sex, a phenomenon not unexpected in this family.

* The author would be glad to hear from any Herbarium having Ecklon and Zeyher's specimens of this variety and to forward specimens of the local form for comparison.

Specimens vary a great deal both in the hairs on the stem, some being almost tomentose and others glabrous, and in the development of the reversed prickles. In the more hairy specimens (the Cape Peninsula form) these prickles are almost obsolete.

I am indebted to Mr. C. G. Alm, at Uppsala, for re-examining Thunberg's types and confirming my opinion.

It is significant that Sonder has divided Ecklon and Zeyher's specimens (2323), both sexes collected together, between these two species, but his reference to the fruit in *G. asperum* (not mentioned by Thunberg) is difficult to understand. It may be stated, perhaps, without comment, that there are a large number of flower buds on Thunberg's type and that such buds rather resemble fruits unless closely examined.

Galium Aparine, L. This annual is said to have occurred formerly as a weed of cultivation, but it appears to have now died out as such, finding the climate too dry. It was, however, recently found growing at Kirstenbosch in a dampish place half-way up Table Mountain, where the adhesive fruit may perhaps have been carried by some bird and, finding this habitat more congenial, it has continued to exist.

Nenax, Gaertn. The genus *Nenax* was founded by Gaertner, who described and illustrated the fruit of a plant in Banks' herbarium, collected by Masson, erroneously attributed to the genus *Cliffortia* (*C. acerosa*). Gaertn. *de fruct. et sem.* pl. 1, p. 165, t. XXXII. f. 7.

This plant, the type of *Nenax acerosa*, Gaertn. (now in the British Museum Herbarium) has recently been examined on my behalf by Mr. N. S. Pillans, who informs me that it is without doubt the species hitherto known as *Ambraria glabra*, Cruse, a plant well known to both of us, which is by no means uncommon in the Cape Peninsula and its environs.

There has, it seems, always been a considerable amount of ambiguity in connection with these two genera. Although it is possible that Cruse overlooked the older genus *Nenax* altogether (*Cruse Dissert. Rub. Cap.*, pp. 16, 17), Sonder in *Flora Capensis* has followed Cruse, but has quoted *Nenax* as a synonym of *Ambraria*, allotting the specific name *acerosa* to *Ambraria acerosa* (*Nenax acerosa*, E. and Z. 2319), which is a very different species from *Nenax acerosa* of Gaertn.

Cruse based his description of *Ambraria glabra* on a female specimen in fruit, collected by Berg at the Cape of Good Hope (now in the Berlin Herbarium) and by some inexplicable error he has described the leaves, which are opposite, as ternate and Sonder has not only repeated this mistake in his key to *Ambraria*, but has added to it by describing the leaves as "6—12 in a whorl," at the same time attributing here E. and Z. 2317, which also has opposite leaves.

I am indebted to Dr. L. Diels at Berlin for the loan of Berg's specimen

to Kew, where Dr. H. G. Schweickerdt kindly examined it for me and found the leaves to be opposite, informing me at the same time that the specimens *Levy's* 5289 and *Salter* 5655, sent for comparison, are undoubtedly the same species. It is evident that these errors which have stood uncriticised for years have made the identification of this plant impossible without reference to the types.

Owing to the very inadequate existing descriptions of this species (indeed the male plant has never been described) a full revised description of the living plant (*Salter* 6376), with a drawing, is appended. (Fig. 1.)

Nenax acerosa, Gaertn. (A revised and amplified description.)
Cliffortia acerosa, M.S., in Herb. Banks ;—*Ambraria glabra*, Cruse. A small perennial dioecious shrublet, 15–30 cm. high, many stemmed from a thick ligneous root and often branched above. *Stem* woody in the lower part, obscurely 4-angled, herbaceous, puberulous or glabrescent and often reddish in the younger branches. *Leaves* opposite, linear, flat above, keeled below, scabrid, mucronate, often minutely seto-ciliate, 0·8–1·5 cm. long, usually longer than the internodes, perfoliately linked at the base, closely congested in 1–4 successive pairs in the axils and appearing to be fasciculate at the nodes. *Stipules* none or very minute. *Inflorescences* in two opposite congested dichasial cymes in the upper leaf axils, from 2–6 flowers arising at each node and appearing verticillate. *Female corolla* up to 1·5 mm. long with 5 (rarely 4) broadly lanceolate erect reddish-yellow lobes, 1–1½ times as long as the tube. *Stamens* none. *Stigmas* 2, densely hirsute, about 7 mm. long, greyish-lilac, with no apparent styles. *Ovary* obovate, subangular, crowned with 5 short thick persisting calyx-lobes. *Fruit* obovate, hard, glabrous, about 4 mm. long, obscurely angled, 4-locular, or, by the fusion of the two vacant cells 3-locular. *Seeds* 2, erect, with basal placentation, solitary in two of the cells.

Male. Usually pentandrous, rarely tetrandrous. *Calyx* minute, obconic with 5 small lobes. *Corolla* 5–6 mm. long, the tube 1·5 mm. long, the lobes linear-oblong, dull yellow obscurely veined with red, rolled backwards, with papillose incurved tips. *Stamens* exserted: filaments filiform, 3–4 mm. long, adnate to the corolla tube in its lower half: anthers oblong, tinged with purple.

As is the case with many of the dioecious Rubiaceae in South Africa, some plants with the male or large corolla have been found to possess hermaphrodite elements either in some or all of the flowers. These vary in progression from those with perfect anthers and only rudimentary ovaries and stigmas to those which have pollenless anthers and are fertile as females. No variations have been found in the purely female plants.

A number of plants observed were stunted and probably affected by grazing. Var. *β tulbaghica*, Sond. is evidently only an ungrazed luxurious form.

Hab. Cape of Good Hope; *Bergius* (in Berlin Herbarium): Cape Peninsula; *Levy* 5289, Buffels Bay: *Salter* 5655, 5689, Kenilworth; 6376, Kommetje; *Bolus* 4997, Cape Flats; *L. Bolus* Bol. Herb. 21813, Koeberg Road; *E. and Z.* 2317, Doornhoogte: Caledon Div.; *Schlechter* 7947 pars., Elandskloof: Worcester Div.; *Van Breda* 169: Tulbagh Div.; *Zeyher* (Tulbagh Waterfall) var. *tulbaghica*, Sond.: also in the opinion of Dr. Schweickerdt, at Kew, *Harvey* 425 and 455. Flowers Sept.-Nov.

That all the existing species of *Ambraria* belong to the genus *Nenax* I have no doubt, and I therefore propose the new name *Nenax divaricata*

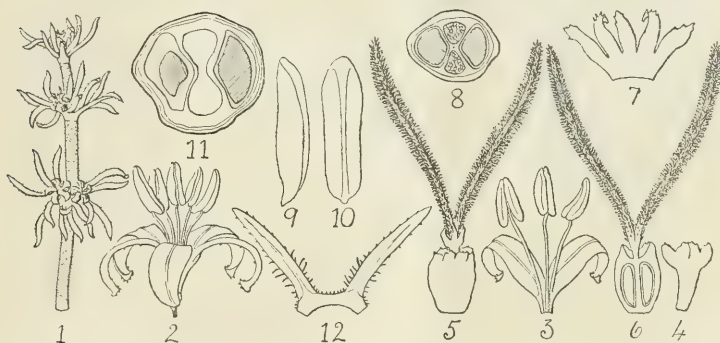


FIG. 1. *Nenax acerosa*, Gaertn. 1. Portion of male plant (natural size). 2. Male flower (side view) $\times 5$. 3. Portion of the male corolla with the stamens attached $\times 5$. 4. Calyx of male flower $\times 20$. 5. Female flower $\times 5$. 6. Longitudinal section of female flower $\times 5$. 7. Corolla of female flower, laid out $\times 10$. 8. Cross section through ovary $\times 10$. 9 and 10. Ovules $\times 5$. 11. Cross section through fruit $\times 5$. 12. Pair of leaves, upper side, laid out $\times 2$ (*Salter* 6376). Del. W. F. Barker.

in place of *Ambraria acerosa*, Sond. The following new combinations are also necessary:—

Nenax microphylla, (Sond.) *Salter* (comb. nov.).

Nenax hirta, (Cruse) *Salter* (comb. nov.).

Nenax Dregei, *L. Bolus* is correctly named.

Carpacoe vaginellata, *Salter*. sp. nov. (Rubiaceae—Anthospermeae.)

Herba parva rigida, scabra, dioecio-polygama, saepius 15—20 cm. alta. *Folia* imbricantia, linearia, vix pungentia, scabra, opposita, basi perfoliata connata; *vaginella* 2—3 mm. longa: *stipulae* minutae vel obsoletae. *Flores* axillares, solitarii, subsessiles. *Calyx* lobis 5 foliaceis, aequalibus, ovario paulum longioribus. *Flores* hermaphroditi; *Corolla*

fere 5 mm. longa, segmentis 5, tubo valde longioribus, saepius perfecti, stigmatē fere 1 mm. longo, nunc ovario styloque subobsoleto, nunc antheris obsoletis et ovario fecundo. Flores feminei; *corolla* ad 1·5 mm. longa, lobis 5 cum tubo subaequantibus. *Stigma* unicum subsessile, fere 1·1 cm. longum, lilaceum. *Fructus* uniloculatus: semen solitarium, 3 mm. longum.

A small erect rather rigid dioecio-polygamous herb, many-stemmed from a ligneous root, up to 30 (often 10—20 cm.) high. *Stems* woody, glabrous below, often branched and papillose-scabrid above. *Leaves* im-

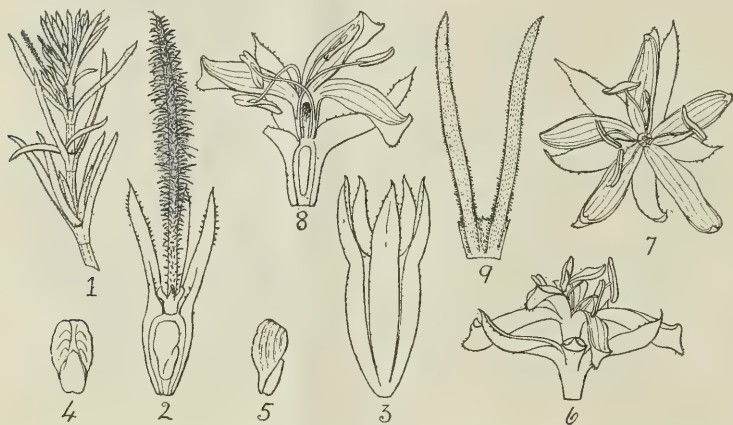


FIG. 2. *Carpacoe vaginellata*, Salter. 1. Portion of female plant (natural size). 2. Longitudinal section through female flower $\times 4$. 3. Fruit $\times 4$. 4 and 5. Inner portion of the fruit (containing the seed) with the outer ribbed portion removed and showing the tubercle $\times 4$. 6. Hermaphrodite flower, side view $\times 4$. 7. Hermaphrodite flower, front view $\times 4$. 8. Longitudinal section through hermaphrodite flower $\times 4$. 9. Pair of leaves $\times 2$. (Salter 6271.) Del. W. F. Barker.

bricating, opposite, closely congested in 1—4 successive pairs in the opposite axils, thick, linear, perfoliately linked at the base into a somewhat loose funnel-shaped sheathing tube 2—3 mm. long, subpungent-mucronate, scabrid, cartilagineo-papillate on the margins, the female 1—2 cm. long, the hermaphrodite rather shorter. *Stipules* minute, often absent. *Flowers* subsessile, solitary in the upper leaf axils. *Calyx* of 5 equal leaf-like lobes somewhat longer than the ovary, or shorter in the fruiting stage. *Corolla* 5-lobed, obscurely yellow, often streaked with red.

Hermaphrodite Flowers. *Calyx* lobes spreading. *Corolla* about 5·5 mm. long, the oblong-lanceolate spreading or recurved lobes hooded at the apex on the upper side, much longer than the tube: stamens well

exserted, the filaments arising from near the base of the tube : anthers versatile. Varying in every degree from those with sterile anthers and fertile female organs to fertile males with only a rudimentary stigma, but usually with perfect flowers in which the stigma is thick and only about 1 mm. long.

Female Flowers. *Calyx* lobes erect. *Corolla* up to 1.5 mm. long, the sub-erect lobes equal to or shorter than the tube. *Ovary* obconic, 2—3 mm. long, 5-grooved, 1-chambered with 1 basal ovule. *Stigma* one, almost sessile, densely hairy, greyish or lilaceous, about 1.1 cm. long. *Fruit** narrowly obovate, 5 mm. long, crowned by 5 persisting calyx lobes. *Ovary* wall splitting into two layers in the fruit : the endocarp becoming detached with the seed and being furnished with a much swollen tubercle partially embedded at the base. (Fig. 2.)

NOTE.—On one plant out of a great many examined (a dwarf with condensed shoots and darker foliage) two of the flowers were found to have 2 styles and a 2-chambered ovary.

Hab. Cape Province : Cape Peninsula ; Muizenberg Mountain, *Salter* 6271 (type in Bolus Herbarium), 275/1 A and B, 275/2, 2681, 2823, 6432, 6489, *Humphrey-Smith* Bol. Herb. 21633 !, *Wright* 530 : Stellenbosch Div. ; ? Hottentots Holland, *Eck. and Zey.* 2313 ! : Bredasdorp Div. ; *Schlechter* 7649 !, *Bolus*, Bol. Herb. 21875 ! : Riversdale Div. ; on Kampsche Berg, *Burchell* 7070, 7124 : Knysna Div. ; *Burchell* 5638 : Humansdorp Div. ; *Galpin* 4104 (ex parte) ! : Grahamstown Div. ; Dassies Klip, *Bolus* 2670 ! : Port Elizabeth Div. ; *Holland* 3856 ! : Bathurst Div. ; *Burchell* 3991. Many of the above consist of only one sex. Flowers April-August.

This plant is widely distributed in the Southern coastal area from Cape Town as far east as Bathurst and has long been confused with *C. scabra*, Sond (type *Anthospermum scabrum*, Thunb.) a species superficially very much like it. *C. scabra* has a 2-chambered ovary with two rugulose whitish-grey seeds, one in each chamber, the calyx lobes vary from 5 to 7 and the leaf pairs are only *very shortly* connate at the base.

I am indebted to Mr. C. G. Alm, at Uppsala, for kindly re-examining Thunberg's specimens of *Anthospermum scabrum* in comparison with examples of my type collecting (*Salter* 6271) and he has confirmed that the differences are as pointed out above.

C. scabra is represented in the Bolus Herbarium by *Bolus* 9054, Clanwilliam (Wupperthal) male and *Compton* 2791, Laingsburg (Witteberg) female in seed, both of which, Mr. Alm informs me, correspond perfectly with the type (*Anthospermum scabrum*, Thunb.). It seems to

*See page 117 of this Journal: "The Ovary and Fruit of *Carpacoe*," by Margaret R. Levyns, to whom I am much indebted for the microscopic investigation of the fruit of this genus.

have its habitat in the drier inland areas where Thunberg may well have collected it on his travels.

It is evident that Sonder (Flor. Cap. III, p. 33), did not suspect the difference between these species, for he attributes *Eck. and Zey.* 2313 to *C. scabra*, whereas this plant is 1-seeded and is undoubtedly the same as my own. Unfortunately I have not seen the other specimens which Sonder quotes (*Bergius, Mundt and Maire*) and I am unable to place them, but they can no doubt easily be determined by the character of the leaf-sheaths. I am indebted to Dr. H. Schweickerdt at Kew for his kindness in identifying *Burchell's* and *Wright's* specimens quoted above.

C. vaginellata has the typical ericoid leaves of the South-western flora and, though a very inconspicuous plant, it is to be found in many localities in the Cape Peninsula. It seems to flower but rarely, usually when unencumbered by surrounding vegetation and most often in fairly recently burnt areas, the separate sexes being on many occasions found alone. I have searched the "type" locality intermittently during the last eight years but it was not until 1936 that I succeeded in finding both sexes flowering in association on a piece of ground which had been fairly recently burnt and, although the plant was plentiful on the unburnt ground in the vicinity, only one or two flowering females could be found. A large colony of old plants occurs on the south slopes of Vasco da Gama Peak, near the Cape of Good Hope, which I have examined thoroughly in three successive seasons, without finding any trace of flowering.

Carpacoea spermacoea, Sond. is a lax plant, common in marshes and moist sheltered places in the Cape Peninsula. The great majority of the plants have the large or male form of corolla with all the flowers protandrous-hermaphrodite, but very rarely purely female flowers with smaller corollas are found on them. I have only found one plant on which all the flowers have the small corolla and are pure females without anthers. It would have been more appropriate to retain *Ecklon's* specific name "foetida" for this species on account of its nauseating scent.

The following is a key to the four known species of *Carpacoea* :

- | | |
|---|---------------------|
| Ovary 2-chambered ; ovules 2, solitary in each chamber : leaf pairs | |
| shortly connate at the base | <i>scabra</i> |
| Ovary 1-chambered ; ovule 1 : leaf pairs connate into a distinct | |
| sheath at the base. | |
| A lax foetid plant : calyx lobes unequal : stipules cleft into | |
| bristles | <i>spermacoea</i> |
| A rigid upright plant : calyx lobes equal : stipules minute | |
| or absent. | |
| Corolla lobes and stamens 5 | <i>vaginellata</i> |
| Corolla lobes and stamens 6 to 7 | <i>heteromorpha</i> |